

FRANKLIN STREET BRIDGE

Pennsylvania Historic Bridges Recording Project - II
Spanning Oil Creek at Franklin St. (State Rt. 8)
Titusville
Crawford County
Pennsylvania

HAER No. PA-494

HAER
PA
20-TITVI,
4-

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HISTORIC AMERICAN ENGINEERING RECORD
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Washington, DC 20240

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Location: Spanning Oil Creek at Franklin St. (State Rt. 8), Titusville, Crawford County, Pennsylvania.

USGS Quadrangle: Titusville South, Pennsylvania (7.5-minute series, 1973).

UTM Coordinates: 17/610530/4608515

Date of Construction: 1939.

Designer: Karl A. Miller.

Builder: Tonawanda Engineering Corporation.

Present Owner: Crawford County.

Present Use: Vehicular bridge.

Significance: Fires and floods during the early days of the oil industry promoted the frequent replacement of the Franklin Street Bridge. The most recent, a tied plate-girder through arch designed by Crawford County Engineer Karl A. Miller, and its twin in Oil City, Venango County, are examples of bridge building at the twilight of riveted steel superstructure design and the local efforts of a gifted engineer.

Historian: Ben A. Shackleford, August 1998.

Project Description: The Pennsylvania Historic Bridges Recording Project II was co-sponsored during the summer of 1998 by HABS/HAER under the general direction of E. Blaine Cliver, Chief; the Pennsylvania Department of Transportation, Bureau of Environmental Quality, Wayne W. Kober, Director; and the Pennsylvania Historical and Museum Commission, Brent D. Glass, Executive Director and State Historic Preservation Officer. The fieldwork, measured drawings, historical reports and photographs were prepared under the direction of Eric DeLony, Chief of HAER.

Titusville

Titusville, Crawford County's second city, was named for Jonathan Titus, surveyor for the Holland Land Company. In 1796, Titus, along with Samuel Kerr, settled what would become known as Titusville.¹ Titus planned the layout of the town in 1809, by 1816 the town had its first store, and by 1847 Titusville was incorporated.² Before Edwin Drake hit oil just south of town, Titusville's main business was lumber. After the oil rush began, Titusville industrialized at breakneck pace. In 1860, the Titusville Iron Company, the city's first foundry, opened. By 1878, E. R. Young & Sons Machine Shop was meeting the equipment repair and construction needs of oil prospectors and refiners and in 1884, the Cyclops Steel Works had opened, producing specialty steel.³ All these industrial enterprises relied on the bounty of oil being drawn up from the lands around Titusville. All these would suffer with Titusville the ravages of nature's course through a landscape made unnatural by unbridled development.

Oil Industry

Timing and Titusville's location determined the key role of the Franklin Street Bridge. The boom town of the oil industry, much of Titusville's interest and traffic drew from the oil country in Venango County just south and east of town. The Franklin Street Bridge was a vital link between the manufacturing and management interests in Titusville and the points of extraction scattered mostly to the south.

As the oil industry developed, a drilling mania swept over the oil country. As the "queen City of the oil region," Titusville garnered a major share of the rewards and costs of the oil boom.⁴ An oil-rush atmosphere kept regulation of oil prospecting to a minimum, and ignorance of safety concerns in oil processing made much of that minimum irrelevant. Floods from land cleared for oil wells, explosions from well torpedo accidents, and fires caused by poor storage tank location and refinery practice together paint a picture of busy, dangerous times.⁵

A Bridge over Oil Creek

The history of the petroleum industry and the history of Titusville are bound tightly together. Indeed, the events which led to the construction of the steel arch carrying State Route 8 over Oil Creek chronicle the efforts to wring precious oil from the hilly regions of northwest

¹ S. P. Bates, *Our County and Its People* (Boston: W. A. Fergusson & Co., 1899), 293.

² Bates, *Our County*, 302, 304.

³ Bates, *Our County*, 345.

⁴ Helene Smith and George Swetnam, *A Guidebook to Historic Western Pennsylvania* (Pittsburgh: Univ. of Pittsburgh Press, 1991), 150.

⁵ Smith and Swetnam, *A Guidebook*, 150.

Pennsylvania.⁶ No fewer than eight bridges have carried Franklin Street traffic over Oil Creek south toward Franklin. Of these, three were built as a consequence of the fires and floods that ravaged the region during the nineteenth century.

Though the bridges themselves, benefitting from centuries of Western engineering practice and decades of American bridge building, were sound structures possessed of sufficient capacity and in good enough condition to serve their purpose, many were caught in the turmoil and disaster resulting from unbridled expansion of an unregulated, completely novel extractive industry. They were situated in the midst of, and funded by, an industry with but shallow reservoirs of practical experience, where the boom atmosphere of quick petroleum fortunes set an often disastrous cadence of rapid construction, disaster, and quick replacement. Nineteenth-century engineering and a boomtown mentality resulted in only tentative control of the elements. The mineral wealth, and numerous failures to control its extraction, gave inhabitants of Titusville many opportunities to reshape their urban landscape and replace, with a variety of structural forms and construction materials, the bridges spanning Oil Creek.

The geography of northwestern Pennsylvania allowed little chance for successful continuous use of a ford to negotiate Oil Creek. The bottom of Oil Creek was loose and muddy in the best of times. During rains or melts, steep topography prompted frequent freshets, further hindering pre-bridge attempts to cross the creek. Given these natural features, a foot bridge may have preceded the more substantial wooden bridge capable of carrying wagon traffic. Probably built as part of the Franklin and Titusville Turnpike Company's wooden road chartered in July 1838, or possibly a consequence of Titus and Kerr's efforts, a wooden bridge did serve southward travelers until its replacement with an iron structure. This wooden, probably covered, bridge built over Oil Creek at Franklin street, in the words of the *Titusville Morning Herald* editor, "succumbed to the pressure of traffic put upon it."⁷

The first metal bridge on the site, an iron braced-chain suspension bridge belonging to the county, spanned Oil Creek until an industrial conflagration rendered it structurally unsound in 1880. Begun by an explosive lightning strike on the oil storage tanks of the Tidioute & Titusville Pipe Line Company, a fire of major proportions devastated Titusville. Flames fed by an estimated 290,000 barrels of oil destroyed most of the refineries and equipment manufactories along Oil Creek as well as numerous dwellings in the residential zone south of the creek.

Along with the Franklin Street Bridge, just upstream, the Perry Street Bridge also succumbed to the blaze. The *Titusville Morning Herald* related the scene in vivid detail: "burning torrents of oil flowed down hill into the creek, and thence swept down stream the

⁶ U.S. Department of the Interior, Geological Survey, *Titusville South Quadrangle: Pennsylvania — Crawford County, 7.5-minute Series* (Washington, D.C.: U.S. Government Printing Office, 1973).

⁷ "Local Intelligence," *Titusville Morning Herald*, 26 Aug. 1880.

flames reaching a height of 100 feet and warping the little Perry street bridge to such an extent that the southern span of that structure caved in.”⁸

Despite the best efforts of local fire companies well experienced in combating volatile oil blazes, all traffic between Titusville and the south was discontinued. Losses were considerable: the “Franklin Street iron brace suspension bridge, belonging to the county partially destroyed — \$3000,” and the “Perry street bridge — \$4000.”⁹

Following the fire, the twisted remains of the suspension bridge were temporarily replaced by a small foot bridge to link the inhabitants of the south side with the business district. With artful wordiness common to nineteenth-century literature, the *Titusville Morning Herald* editor describes how, “just South of the Franklin street bridge a little pre-adamite, antediluvian foot bridge is thrown across the stream which is very picturesque in its miniature usefulness.”¹⁰ Titusville could not long operate without its vital link between the oil fields of Venango County just south of town and the oil exchange in the town proper. To facilitate communication between buyer and seller, the foot bridge became the third bridge of record on that site.

The fire of 1880 led to the erection of a Howe truss bridge by representatives of the Morse Bridge Company of Youngstown, Ohio. Apparently the reconstruction of this vital transportation link took much longer than some citizens deemed appropriate. The editor of the *Titusville Morning Herald*, eager for the bridge, commented,

The Franklin street bridge is now nearly ready for floors and will probably be completed this week. There has no end of delays necessary and unnecessary in the work which should have been done a month or more ago. In the first place, the County Commissioners moved with majestic slowness in the matter and when at last the bridge was ordered from the Morse Bridge Company, of Youngstown Ohio and shipped, it took it eight days to travel 120 miles. There was a similar delay in receiving the lumber for the flooring. After the construction began, the settling of the temporary scaffolding in the soft bottom of the creek caused another delay of two days.¹¹

Though N. B. Holeton, Morse’s supervisor of construction, erected the bridge in less than three weeks during August 1880, it apparently was not quick enough to satisfy the fast-paced oil region.¹²

⁸ “Flames 100 ft.,” *Titusville Morning Herald*, 1890.

⁹ “Damages,” *Titusville Morning Herald*, 1892.

¹⁰ “Local Intelligence,” *Titusville Morning Herald*, 24 Jun. 1880.

¹¹ “Franklin Street Bridge,” *Titusville Morning Herald*, 1890.

¹² “Franklin Street Bridge,” *Titusville Morning Herald*, 26 Aug. 1892.

Though the great fire had occurred on 12 June, the editor of the newspaper, and presumably others in town, expected the bridge to be replaced within a month.¹³ This reflects two themes of nineteenth-century bridge construction in Titusville. First, the citizens of the booming oil region had little patience with the county commissioners based in the slower-paced western part of the county. This impatience probably did little to endear Titusville to the county commissioners and speed bridge replacement. Second, fabrication and erection of a bridge required nearly two months. It is probable that the catalogs of the Morse Bridge Company, like those of other bridge companies, gave the impression that the bridges were in stock, awaiting shipment when ordered.¹⁴ In reality, the bridge was likely erected first at the Morse shops, dismantled, shipped, and then reassembled on site. The delays discussed by the editor were likely a consequence of living in a world where rapid change was a matter of course, and misunderstanding the process of wrought iron truss construction.

The bridge of 1880 was a wooden-floored wrought-iron Howe through truss, 80'-0" long, with an 18'-0" roadway flanked by 6'-0" sidewalks. The truss was 18'-0" tall from pin to pin and was designed to support 160 pounds per square foot. Construction took the better part of a month, and was completed less than three months after the fire. A flood destroyed the Morse-built Howe truss over Oil Creek in 1883, just three short years later. An article from 1939 indicates that a third iron truss bridge, about which no information could be found, replaced the one lost in the first great fire after spring flooding removed the 1880 bridge.

Franklin Street Bridge of 1892

The conflagration of 1880 paled in comparison to the debacle of 1892. This blaze, whose devastation reached southward along Oil Creek to Oil City, began conurbations between the Franklin Street Bridge in Titusville and the Center Street Bridge in Oil City that remain to this day. As in the Titusville fire of 1880, incomplete safety precautions in Titusville and Oil City prompted by the inexperience of all those involved in the blossoming oil industry, and the rapid rate of growth combined to create a naturally provoked disaster of massive proportions.

Heavy rains prompted the destruction. Flooding ruptured numerous oil and benzene tanks throughout Titusville, floating flammables atop Oil Creek, which were ignited by the ubiquitous refinery flames. The fiery torrents rushed through the low-lying portions of Titusville, and thence south to Oil City. The devastation in both towns was considerable, and both lost bridges over Oil Creek. A sense of the devastation wrought by the burning waters was given by the *Titusville Morning Herald*:

where the iron bridge once stood but is now gone, a portion still hanging at the railroad trestle 500 feet below, which stopped its passage, though itself was

¹³ "No Bridge," *Titusville Morning Herald*, 1892.

¹⁴ Thomas Wimpenny, *Without Cutting, Filing, or Chipping* (Easton, Pa.: Canal History & Technology Press, 1996), 20.

slackened and loosened in every stone and timber at the dreadful encounter of such a tremendous force of weight.¹⁵

Indeed, the channel of Oil Creek itself moved 200 feet, carrying away up to 60 feet of bank in places.¹⁶ The torrents carried the burning oil, supplemented by rupturing oil tanks along the way, nearly fifteen miles downstream to Oil City. The devastation of Oil City was itself considerable, though alleviated somewhat by less severe flooding ensured by a deeper creek bed.

The schedule for replacement of the Franklin Street Bridge proceeded no faster than the 1880 replacement. This time, however, Titusville residents seemed less anxious about the matter, possibly because of more pressing concerns such as replacing water mains destroyed by the fire.¹⁷ To provide a pedestrian crossing of Oil Creek, a wooden foot bridge was constructed on 8 July, allowing some traffic flow as rebuilding efforts continued.¹⁸ It was not until 3 August, however, that Mayor E. O. Emerson ventured to Meadville to meet with the Crawford County Commissioners and "urge all possible haste in the matter" of erecting a new vehicular bridge.¹⁹ Yet other events, far outside of the jurisdiction of the Crawford County commissioners, caused additional delays.

The changed course of Oil Creek meant that residents of the south side, those living along Bank Street, lost real estate in the flood. They submitted a petition protesting the abutment work begun by a contractor named Alcorn. The *Morning Herald* reported:

A petition was circulated yesterday among the residents of Bank street, which was signed by every resident of the street. It demurs against the erection of the abutment for the new bridge at the foot of Franklin street as at present begun ... it is hoped an injunction will be obtained. The abutment, as it is now being built, will interfere with the reconstruction of the at part of Bank street which the flood destroyed, if it should ever be done.²⁰

The protest delayed the work of Alcorn but one day. On 3 September work on the abutments resumed.²¹

The Homestead steel strikes of 1892 delayed delivery of the trusswork for the Perry Street Bridge. Though it is unclear who supplied steel to the Penn Bridge Company, builders of

¹⁵ "Local Intelligence," *Titusville Morning Herald*, 9 Jun. 1892.

¹⁶ "Local Intelligence," *Titusville Morning Herald*, 8 Jun. 1892.

¹⁷ "Local Intelligence," *Titusville Morning Herald*, 9 Jun. 1892.

¹⁸ "Brevities," *Titusville Morning Herald*, 9 Jul. 1892.

¹⁹ "Local Intelligence," *Titusville Morning Herald*, 4 Aug. 1892.

²⁰ "Local Intelligence," *Titusville Morning Herald*, 1 Sep. 1892.

²¹ "Local Intelligence," *Titusville Morning Herald*, 3 Sep. 1892.

the 1892 Franklin Street Bridge, it might explain the delivery of bridge parts on 26 November, nearly two months after the completion of the abutments, and six months after the fire.²² By 6 December all the iron had been delivered and the work of erecting the structure begun by Gahan and Company. By 15 December, the first vehicle had crossed the eleven-panel, single-lane Parker truss fabricated by Penn Bridge Company, the latest Franklin Street Bridge.²³ By the second week of 1893, the details of the bridge were finished.

The Parker truss over Oil Creek served well into the twentieth century. The ravages of combined natural and unnatural disasters ceased as the oil boom moved to other regions. The passage over Oil Creek became a point of transit, more than a point of civic pride or economic interest. Ultimately the burden of modern traffic led to repair and replacement of the structure. Crawford County bridge engineer Karl A. Miller began specified repairs in October 1934. The Pittsburgh Welding Corporation bid \$475 for reinforcement of the eye bars and the tension elements under the sidewalks, and was given additional work reinforcing thirty-two chord bar plates and eight vertical hangers, slotting chord plates, and welding together broken floor beam hangers and floor beam stiffeners.²⁴ Vibration-related damage of this nature — cracked tension elements and broken binders — signal the absence of heavy, rapid, motorized traffic during the design of the bridge. With the Depression restricting the availability of new bridge funds, repair instead of replacement would have to suffice. These repairs continued the life of the 1892 bridge, but a more appropriate new design soon replaced the tiring truss over Oil Creek.

The Arch of 1939

In late September 1939, the 1892 Parker truss was dropped into Oil Creek. Flames from acetylene torches, rather than burning oil flowing down a hillside, ushered the structure into posterity. Workers from the B. Levy Estate dropped the bridge into the creek to facilitate salvage.²⁵ The demolition came four months after a design for a new bridge had been submitted by Crawford County Engineer Karl A. Miller on 15 May 1939.²⁶ Where three wooden and four iron bridges had carried traffic over the usually mild waters of Oil Creek, the eighth would be steel.

Plans for the new Franklin Street Bridge were begun in March 1939. Crawford County Engineer Karl A. Miller conducted surveys that same month, and a grand jury approved the bridge's replacement on 1 May. On 17 July the Tonawanda Engineering Company's bid was

²² "Local Intelligence," *Titusville Morning Herald*, 22 Nov. 1892.

²³ Karl A. Miller, "Franklin Street Bridge," drawing, 1939.

²⁴ Karl A. Miller Papers, Crawford County Historical Society, Meadville, Pa.

²⁵ "Frame of Bridgework Drops Into Creek," *Titusville Herald*, 25 Sep. 1939.

²⁶ Karl A. Miller, "Franklin Street Bridge."

accepted, work began a week later, and the bridge was officially opened with a public ceremony on 23 December.²⁷

Description

The tied through arch designed by Karl A. Miller reflects the experience and talent of a local engineer. The arch ribs consist of steel plates riveted up into box sections, each 180'-0" long and 30'-0" high at their apex. Each box section is 3'-9" deep and 2'-0" wide. The bridge rests atop one fixed pivot and one rocker. The ends of each rib are tied with tension members consisting of five sets of four eye-bars. From seven points along the arch are hung vertical elements supporting rolled steel floor beams, spaced 22'-6" on center. Between these 36"-deep transverse floor beams, eleven evenly spaced 14"-deep stringers run parallel to the roadway, supporting a 3"-thick steel grating. The roadway is 32'-0" wide from curb to curb and stretches 180'-0" across the creek 15'-0" below.²⁸ 6'-0"-wide sidewalks with handrails, also with floors of steel grating, are cantilevered outside either arch rib.

The use of steel for the 1939 Franklin Street Bridge marks an important departure from the iron prevalent in previous structures. The homogeneity of steel, and significant development of the welding alloys and technology during the first decades of the twentieth century, permits welded repairs and reinforcement to maintain, even enhance, the designed performance limits of a bridge. In 1981, the steel floor was removed and replaced by a poured concrete floor. To increase the bridge's load-bearing capacity, the floor was cast around channels welded atop the existing stringers. Welding thus enabled the strength of reinforced concrete to supplement the strength of the floor structure. By rooting this steel in the monolithic slab, the entire floor system acts as a single rigid plate, distributing load across and down the structure as vehicles pass over the bridge and raising the effective live load limit of the bridge.

Oil City received a new bridge in the same year as the citizens of Titusville. The arch carrying Center Street over Oil Creek as it passes through Oil City is of the same design and construction as the arch over Oil Creek in Titusville. Built in 1940 by the Tonawanda Engineering Company, the bridge was also designed by Karl A. Miller. Apparently, the design was economical enough to be passed on to neighboring Oil City.²⁹

Karl A. Miller

Karl A. Miller was part of the Allied Expeditionary Force sent to Europe at the close of World War I. His task as a surveyor for the army of occupation kept him in Germany and France from 1919 until 1921. By 1925, Miller was working as the county engineer for Crawford

²⁷ "The Year in Review," *Titusville Herald*, 1 Jan. 1940.

²⁸ Karl A. Miller, "Franklin Street Bridge."

²⁹ Charles D. Martens, *Oil City: A History* (Oil City, Pa.: First Seneca Bank & Trust Co., 1971).

County. His correspondence while county engineer denotes an individual devoted to his work and interested in maintaining as many original structures as possible. The strong ties he developed with the Pittsburgh Welding Company (personal letters were exchanged with the president) and examples of correspondence to suppliers of original materials for the bridges in his charge demonstrate his willingness to repair and maintain rather than replace. A letter of inquiry to the manufacturers of Kreolite flooring, the wooden block used as the wearing surface on some Crawford County bridges, demonstrates a desire to repair bridges with original materials. Yet Miller was also willing to innovate. Among his personal photographs, numerous examples of local bridges seem also to demonstrate an enthusiasm for the incredible variety of structures in Crawford County.

The design of the Franklin Street Bridge seems to demonstrate a nostalgia for iron bridges. When many new bridges were being built of reinforced concrete, Miller chose to develop a design that reflected a local affinity for trussed structures. Both the Franklin Street and the Center Street tied through arches are fine examples of tied arch trusses. Anomalies at their time of construction, they continue to represent the interest and talent of their designer and the towns that they serve.

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